

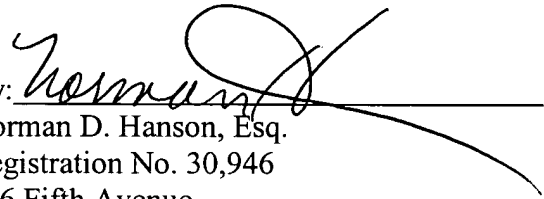
13. (new) The method of manufacturing a glass panel as claimed in claim 11, wherein said pair of glass sheets comprises an upper glass sheet and a lower glass sheet, wherein said lower glass sheet has a greater area than said upper glass sheet so that each said peripheral edge of said lower glass sheet protrudes from each said peripheral edge of said upper glass sheet.

REMARKS

Applicants have cancelled claims 1 to 3 and added new claims 4 to 13. Entry of the foregoing amendment is requested. No new matter is presented.

Respectfully submitted,

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Showing of Changes**Page 1, lines 7-10**

The present invention relates to a glass panel including a pair of glass sheets disposed in opposition to each other with a gap formed therebetween, peripheral edges of the two glass sheets being bonded with low temperature melting glass for sealing the gap.

Page 1, lines 14-30; page 2, lines 1-26

The low temperature melting glass is often used for sealing the gap of such glass panel as above because it has superior adhesive property to e.g. metal solder. Conventionally, the low temperature melting glass in the form of paste would be applied to the peripheral edges of the two glass sheets and heated to 480°C or higher, thereby to render the low temperature melting

glass into melted state. Then, it would be cooled to the normal temperature for solidification, whereby the peripheral edges of the glass sheets were bonded for sealing the gap.

However, since the low temperature melting glass has good adhesive property for the glass sheets, the glass under its melted state also has good wettability to the glass sheets. Then, as shown in Fig. 8, in a cross section substantially normal to the faces of the glass sheets 1, 2, an adjacent face 4b of the low temperature melting glass 4 adjacent the gap V is formed as a concave face with its center portion between the glass sheets 1, 2 extending away from the gap V.

Then, according to the convention, the glass would be cooled and hardened directly under such condition. Hence, in the conventional glass panel, the adjacent face 4b of the low temperature melting glass 4 adjacent the gap V is formed as a concave face with its center portion between the glass sheets 1, 2 extending away from the gap V.

Therefore, with the conventional glass panel, at opposed ends of the adjacent face 4b of the low temperature melting glass 4, there are formed sharp edged portions 4c contacting the glass sheets 1, 2 and projecting toward the gap V. Then, for instance, when a wind pressure acts on the faces of the glass sheets, as denoted by arrows in Fig. 8, thereby to apply a force which tends to displace the two glass sheets 1, 2 closer to each other, there occurs stress concentration at the sharp edged portions 4c at the opposed ends of the adjacent face 4b and the two glass sheets 1, 2 will tend to be bent in the mutually approaching direction, thus tending to bend the sharp edged portions 4c. As a result, the sharp edged portions 4c would often be cracked and damaged.

Moreover, when the sharp edged portions 4c are damaged, due to the characteristics of the low temperature melting glass vulnerable to brittle fracture, the crack would develop from that damaged portion. For this reason, the conventional glass panel has a shortcoming in the strength of the low temperature melting glass used for bonding and sealing the peripheral edges of the two glass sheets. This shortcoming would appear especially conspicuously with a vacuum double glazing with the gap between the opposed glass sheets being maintained under a depressurized state.

The present invention addresses to such shortcoming of the convention and its object is to provide a glass panel which even when constructed as a vacuum double glazing, can effectively prevent damage in the low temperature melting glass portion thereof by improving the strength of the low temperature melting glass used at the peripheral edges of the two glass sheets.

Page 3, lines 2-24

A glass panel relating to claim 1, as illustrated in Fig. 3 and Figs. 5-7, includes a pair of glass sheets 1, 2 disposed in opposition to each other via a gap V therebetween, peripheral edges of the two glass sheets 1, 2 being bonded with low temperature melting glass 4 for sealing the gap V, wherein in a cross section substantially normal to faces of the two glass sheets 1,2, an adjacent face 4a of the low temperature melting glass 4 adjacent the gap V has a center portion thereof between the two glass sheets 1, 2 bulging toward the gap V.

With this construction, in the cross section substantially normal to the faces of the two glass sheets, the adjacent face of the low temperature melting glass adjacent the gap has a center portion thereof between the two glass sheets bulging toward the gap. Hence, even though the construction employs the low temperature melting glass having good adhesive property to the glass sheets, the construction does not have the sharp edged portions which are present in the conventional glass panel, that is, the sharp edged portions which contact the two glass sheets and which project toward the gap. Therefore, there will occur no damage in the sharp edged portions or no development of crack from the damaged portion at all.

And, even when a wind pressure or the like acts on the faces of glass sheets, tending to displace the glass sheets closer to each other, this stress will be dissipated toward the bulging portion located at the center between the two glass sheets. So, there hardly occurs any stress concentration. Consequently, the strength of the low temperature melting glass at the peripheral edges of the glass sheets can be improved significantly.

Page 3, lines 28-30; page 4, lines 1-3

With this construction, since the adjacent face is formed as a curved face bulging toward the gap, compared with a construction wherein the adjacent face is formed as a face bulging toward the gap at an acute angle, the above construction can avoid stress concentration even more reliably.

Hence, the strength of the low temperature melting glass at the peripheral edges of the glass sheets can be further improved.

Page 4, lines 11-16

And, with such glass panel, the atmospheric pressure is constantly applied to the faces of its glass sheets, thus causing problem in the strength of the low temperature melting glass. However, as described above, the strength of the low temperature melting glass can be improved. As a result, it is possible to provide a glass panel which has the superior thermal insulation performance and also superior strength.

Page 5, lines 14-22

An example of such glass panel is a double glazing. This double glazing P, as shown in Fig. 1, includes a pair of glass sheets 1,2 and a number of spacers 3 interposed between faces of the two glass sheets 1,2, so that the two glass sheets 1, 2 are disposed in opposition to each other with forming a gap V therebetween. Peripheral edges of the two glass sheets 1,2 are bonded together with a low temperature melting glass 4 which has a lower melting point than the two glass sheets 1, 2 and which also has a low gas-permeability, and the gap V between the glass sheets 1, 2 is sealed under a depressurized state.

Page 5, lines 27-30; page 6, 1-6

Referring to the depressurization of the gap V, though described in details later, for allowing depressurization of the gap V, one glass sheet 1, as shown in Fig. 4 in details, defines an evacuation hole 5 consisting of a large-diameter hole 5a having an approximate diameter of 3 mm and a small-diameter hole 5b having an approximate diameter of 2mm; and a glass tube 6 is inserted into the large-diameter hole 5a. Then, this glass tube 6 is fixedly bonded to the glass sheet 1 with a low temperature melting glass 7 having a lower melting point than the glass tube 6 and the glass sheet 1 and the leading free end of the glass tube 6 is sealed by means of fusing and the entire tube is covered with a cap 8.

Page 6, lines 18-23

First, of the pair of glass sheets 1, 2, the glass sheet 2 not defining the evacuation hole 5 is supported substantially horizontally horizontal and on the top face of its peripheral edge, the low

temperature melting glass 4 in the form of paste is applied and also the many spacers 3 are disposed with the predetermined inter-distance therebetween. Then, as shown in Fig. 5 (a), the other glass sheet 1 is placed over them from the above.

Page 6, lines 28-30; page 7, lines 1-5

Thereafter, as shown in Fig. 2, the glass tube 6 is inserted into the evacuation hole 5 of the upper glass sheet 1. As this glass tube 6 can be inserted into only the large-diameter hole 5a of the evacuation hole 5 and has a length greater than that of the large-diameter hole 5a, the upper portion of the glass tube 6 will project from the glass sheet 1. Then, about this projecting portion of the glass tube 6, low temperature melting glass 7 having a donut-like shape is fitted and an evacuation sealing device 9 is placed over this assembly.

Page 7, lines 12-30; page 8, lines 1-5

With the evacuation sealing device 9 placed thereon, the two glass sheets 1, 2 are charged into and housed under substantially horizontal posture in a heating furnace 14. By baking, the low temperature melting glass 4 is molten and with the low temperature melting glass 4 under this molten state, the peripheral edges of the opposed glass sheets 1, 2 are bonded together thereby to seal gap V. This completes the bonding operation.

Specifically, the temperature inside the heating furnace 14 is elevated to 480°C or higher for melting the low temperature melting glass 4. In this, as the molten low temperature melting glass 4 has good wettability to the two glass sheets 1, 2, as shown in Fig. 5 (b), in a cross section substantially normal to the faces of the two glass sheets 1, 2, an adjacent face 4 of the low temperature melting glass adjacent the gap V will be formed concave relative to the gap V and with the melting of this low temperature melting glass 4, the low temperature melting glass 7 about the glass tube 6 too is melted to flow into the gap between the large-diameter hole 5a and the glass tube 6.

Thereafter, there is effected a baking step for evacuating gas present inside the gap V through the glass tube 6 inserted in the evacuation hole 5, by heating the gap V between the glass sheets 1, 2 with maintaining the temperature inside the heating furnace 14 at 400°C or higher, which is equivalent to a softened state of the low temperature melting glass 4 when it has a viscosity of

10^{11} poise, i.e. a softened state of 10^{10} Pascal/sec. (Pa · s) or lower, in other words, before its viscosity exceeds 10^{10} Pascal/sec. (Pa · s), while maintaining the viscosity of the low temperature melting glass 4 at the softened state of 10^{10} Pascal/sec. (Pa · s) at the same time.

Page 8, lines 11-15

When this baking step is being carried out, the low temperature melting glass 4 is under the softened state having the viscosity of 10^{10} Pascal/sec. (Pa · s). Hence, in association of the depressurization of the gap V, its adjacent face 4a will be formed into a curved face bulging toward the gap V, as shown in Fig. 3 or Fig. 5 (c).

Page 8, lines 21-30

With the vacuum double glazing manufactured in a manner described above, as seen in a cross section substantially normal to faces of the opposed glass sheets 1, 2, the adjacent face 4a of the low temperature melting glass 4 is formed as the curved face bulging toward the gap V.

Therefore, even when the two glass sheets 1, 2 are subjected to a force which tends to displace the sheets closer to each other, as indicated by arrows in Fig. 7, its stress will be dissipated toward the bulging portion, so that substantially no stress concentration will occur. Hence, in comparison with the conventional construction shown in Fig. 8, the strength of the low temperature melting glass 4 can be improved significantly.

Page 12, lines 19-30; page 13, lines 1-8

In the foregoing embodiment, by effecting the baking step for evacuating and eliminating gas from the gap V between the two glass sheets 1, 2, the adjacent face 4a of the low temperature melting glass 4 was formed into the curved face bulging toward the gap V. Instead, after application of the low temperature melting glass 4 thereto as shown in Fig. 6 (a), in the heated softened state of the low temperature melting glass 4, as shown in Fig. 6 (b), a pressing operation may be effected for pressing at least the peripheral edges of the two glass sheets 1, 2 to be closer to each other and with maintaining this pressing, the low temperature melting glass 4 may be allowed to cool so as to cause the adjacent face 4a of the low temperature melting glass 4 to be bulged toward the gap V. Further, by using the pressing operation and the baking operation in combination, the adjacent face 4a of the low temperature melting glass 4 may be formed into the curved face bulging toward the gap V.

Moreover, this adjacent face 4a need not necessarily be formed into such curved face. Instead, for instance, it may be bulged toward the gap V in the form of e.g. a trapezoid or a triangle. Further, regarding the timing of effecting this bulging process also, after effecting the bonding step, the low temperature melting glass 4 may be once cooled to the room temperature and then this glass 4 may be heated again to its softened state and the above-described bulging step may be carried out then.

Page 14, lines 12-18

Further, regarding the low temperature melting glass 7 for fusing the glass tube 6, it is also possible to employ a crystalline low temperature melting glass which completes its crystallization at a high temperature range or a non-crystalline low temperature melting glass. Similarly, regarding the low temperature melting glass 4 for bonding and sealing the peripheral edges of the two glass sheets 1, 2, it is possible to employ either crystalline or non-crystalline low temperature melting glass.

REMARKS

Entry of the foregoing amendment is requested. No new matter is presented.

Respectfully submitted,

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